A laboratory study of affectivity in schizotypy: Subjective and lexical analysis

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ABSTRACT

Affective dysfunction is a defining schizotypy feature; yet the majority of studies examining affective dysfunction have largely relied on self-report of trait affect, which reflects only one dimension of emotional experience. Emerging research has explored a second dimension, state affect, using laboratory manipulation, with most finding that schizotypal participants report experiencing less positive/more negative affect than controls. This study expands upon this topic by examining patterns of state affect in psychometrically identified schizotypy through self-report and lexical expression in reaction to emotionally valenced photos. Overall, the schizotypy group reported less positive/more negative affect across affect induction conditions. Both schizotypy and control groups’ affect ratings were similar following the unpleasant stimuli; but the schizotypy group’s ratings remained significantly less positive/more negative than the control group following the pleasant stimuli. This pattern suggests that the schizotypy group experienced a deficit in emotional reactivity compared to controls in pleasant situations. The schizotypy group also used a higher percentage of negative words and a lower percentage of positive words in vocalized reactions during the pleasant, but not unpleasant, affect induction condition. These results reveal a specific pattern of “in-the-moment” affective dysfunction unique to pleasant situations that is consistent across both subjective experience and lexical expression.

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1. Introduction

Studies employing self-report measures of trait affect have consistently found that individuals with schizotypy, a putative genetic vulnerability to schizophrenia that may or may not manifest as clinical symptoms (Meehl, 1962, 1990), report generally experiencing more negative and less positive affect than their non-schizotypal peers (Gooding and Tallent, 2003; Kerns, 2005; Lewandowski et al., 2006). Affective disturbances in schizotypy are associated with a wide range of functional difficulties. For example, negative schizotypy symptoms, which include interpersonal deficits such as constricted affect and lack of close friendships, are uniquely correlated with poorer quality of life across several domains ranging from relationships to health concerns (Cohen and Davis, 2005), and impairments in emotional intelligence and emotion management in schizotypy are related to problems in social functioning (Aguirre et al., 2008). Furthermore, studies have linked the pattern of high negative and low positive trait affect to increased risk for the development of psychosis among at-risk individuals (see Horan et al., 2008, for a review).

This pattern of self-reported increased negative and decreased positive trait affect in schizotypy is consistent with self-reported trait affect in schizophrenia patients (Blanchard et al., 1998; Horan and Blanchard, 2003; Horan et al., 2007, 2008). However, while research in schizophrenia has found that trait and state experience are not necessarily congruent—i.e., individuals with schizophrenia generally report levels of positive emotion similar to that of controls in immediate response to evocative stimuli in the laboratory and in their daily lives (Kring, 1999; Horan et al., 2006; Gard et al., 2007; Herbener et al., 2007; Gold et al., 2008; Cohen and Minor, 2010), the relationship between state and trait affective experience in schizotypy is less well-understood. Thus far, the discrepancy between state and trait affectivity found in schizophrenia has not been observed in schizotypy. A growing body of research exploring state affect in schizotypy utilizing laboratory-based mood-induction procedures has found that schizotypy is associated with reports of less positive or more negative in-the-moment experience compared to controls (Fitzgibbons and Simons, 1992; Fiorito and Simons, 1994; Ferguson and Katkin, 1996; Gooding et al., 2002; Mathews and Barch, 2006; Kerns et al., 2008; Leung et al., 2010). To our knowledge, only two null findings exist (Berenbaum et al., 1987; Germans and Kring, 2000).

The present study employed experimental mood-induction procedures to further clarify the relationship between trait and state affective experience in schizotypy and address certain limitations in the existing literature. First, the majority of these prior laboratory-based studies of state-based affect in schizotypy have focused solely on the relationship between affective experience and physical anhedonia (e.g., Berenbaum et al., 1987; Mathews and Barch, 2006). This trait-specific approach fails to account for other schizotypal traits such as...
disorganization or positive traits, which have been linked to a range of affective dysfunction through trait-based self-report (Kerns, 2005, 2006). Even studies which have compared specific schizotypy symptoms such as social anhedonia and perceptual aberration/magical ideation (Kerns et al., 2008) do not offer a complete exploration of the heterogeneous schizotypy population. This study addresses this limitation by utilizing a measure of schizotypy that assesses a broader range of traits, the Schizotypal Personality Questionnaire (SPQ: Raine, 1991), thereby increasing the generalizability of results for schizotypy as a whole, and allowing comparison of affective dysfunction across levels of positive, negative, and disorganization symptom severity. Second, this study expands upon the understanding of state affect by not only comparing reported affective response following presentation of pleasant, unpleasant, and neutral stimuli, but also examining the pattern of pre-exposure to post-exposure changes in state affect within each affect induction condition. Given consistent prior findings of affective dysfunction at the trait level, an approach to examining state affect that takes into account its temporal development in response to emotionally valenced environmental stimuli could increase our understanding of the interaction between baseline mood and state-based affective experience. To our knowledge, no prior studies have examined the temporal development of state affective reactivity under laboratory-based affect induction conditions in schizotypy. Finally, this study expands our understanding of dimensions of affect beyond subjectively appraised experience by also measuring lexical affective expressivity, an indirect measure of state affectivity operationalized as emotional word choice in natural speech as participants discuss their reaction to evocative stimuli (Pennebaker, 2007). This behavioral-based measure reflects an alternate method of understanding emotional experience that has been employed in prior studies investigating affective dysfunctions in the schizophrenia spectrum (Cohen et al., 2008, 2009), and may reflect affective processes that are less influenced by demand characteristics and higher order evaluative processes than explicit self-report.

2. Methods

2.1. Participants

Participants in the laboratory phase of this study were 41 male and 77 female undergraduate students recruited from Louisiana State University. There were 91 participants in the schizotypy group (28 men; 63 women) and 27 controls (13 men, 14 women). The sample comprised 100 Caucasians, 10 African-Americans, 3 Asian-Americans, 1 Hispanic-American, and 4 participants who self-identified their ethnicity as “other.” The average age was 19.31 (S.D. = 1.97), and all participants were fluent in English. Students were invited to participate in this laboratory phase based on responses to an on-line survey offering a chance to win one of ten $25 prizes, which was sent by email to Americans, 1 Hispanic-American, and 4 participants who self-identified their ethnicity as “other.” The average age was 19.31 (S.D. = 1.97), and all participants were fluent in English.

2.2. Trait affect

2.2.1. Affect induction

For the affect induction procedure, participants were seated in a quiet room in front of a 17-inch flat screen computer monitor. The only other person in the room was the research assistant, who sat out of the participant’s view during the procedures. Participants were asked to view six separate blocks of photographs (three blocks per administration) on the computer monitor (run using Eprime software version 2.0 (Psychology Software Tools, 2002)). Each block contained five pleasant (picture numbers 2080, 5910, 2360, 7325, 4643, 4626, 7502, 7330, 1710, 2391), unpleasant (picture numbers 9800, 9570, 5902, 6350, 6821, 5910, 6540, 9571, 6242, 9594), or neutral (picture numbers 7496, 7595, 7002, 7037, 7057, 7004, 7056, 7495, 7546, 7620) photographs from the International Affective Picture System (IAPS; Lang, et al., 2005). Participants viewed the photograph blocks across two administrations, each containing one pleasant, one neutral, and one unpleasant photograph block, separated by an hour. Block order and picture order within blocks were random. Individual photographs were displayed for 40 s each. Blocks were separated by a 30 second interval during which participants were instructed to “relax and breathe deeply.” Participants were asked to verbalize their thoughts about the photos during the full stimulus presentation period, including how each photo made them feel and of what it reminded them. This process has been demonstrated to produce robust changes in self-reported subjectively experienced emotional state (Cohen et al., 2010a), and has been used to induce affective states in schizophrenia (Hempel et al., 2005; Wolf et al., 2006; Neumann et al., 2007) and schizotypy (Goody et al., 2002; Kerns et al., 2008).

2.2.2. Self-report of state affect

Before and after each block, participants rated their emotion levels using the Self-Assessment Manikin (SAM, Lang et al., 2005), an analog scale ranging from 1 (positive emotion) to 9 (negative emotion). Explicit affect induced by each affect induction condition was measured by averaging the SAM ratings obtained during the two administrations (Pearson’s r). Participants rated their affect across administrations ranged from 0.45 to 0.63, Ps < 0.001.

2.4. Affective expression across affect induction conditions

Lexical analysis was performed on transcriptions of speech samples recorded during each block, using LIWC2007 software (Linguistic Inquiry and Word Count; Pennebaker, 2007), which generated percentage scores for positive and negative words used during each mood induction category. LIWC-assisted analyses have been used by several studies to examine lexicalomic and functional dimensions in psychopathology (e.g. Junghaenel et al., 2008), including schizophrenia (Cohen et al., 2008, 2009) and schizotypy (Cohen et al., 2011a). Construct validity of the LIWC program has been supported for use in examining verbal emotional expression in response to mood induction procedures (Kahn et al., 2007).

Individuals scoring at or above the 95th percentile (1.65 S.D. from the ethnicity and gender determined means) on the positive, disorganization, and/or modified negative subscales of this modified SPQ were identified as schizotypal and invited to participate in the laboratory phase. Of these schizotypy participants, 34% fell above the 95th percentile on the positive SPQ subscale, 40% feel above the 95th percentile on the disorganization subscale, and 38% fell above the 95th percentile on the modified negative scale. (There is some participant overlap in scale elevations due to the non-mutually exclusive nature of the symptom categories.) This selection process ensured a heterogeneous representation of symptom profiles in our schizotypy group. Furthermore, due to the heterogeneous nature of the schizotypy group, distribution of symptom subscale scores within the schizotypy group were all normal (all skew and kurtosis values < 1.00), thus providing adequate variability of symptom subscale scores to allow for meaningful examination of correlations between different symptoms at the subscale level and self-report and lexical variables. Control subjects were identified based on scores below the ethnicity and gender determined means for each of the positive, disorganization, and negative SPQ scales. This study was approved by the LSU Human Subject Review Board and all subjects offered informed consent prior to completing the online surveys and participating in the laboratory phase.

2.3. State affect

The PANAS presents participants with 10 positive (e.g., interested, excited) and 10 negative (e.g., distressed, upset) affective states, and asks them to rate the extent to which they have experienced such states during the prior week on a scale from 1 (“very slightly or not at all”) to 5 (“extremely”).
groups’ ratings changed in the expected direction in response to the stimuli, but the schizotypy group’s ratings were consistently more negative/less positive than the control group’s both before and after stimuli presentation. See Fig. 1.

3.2. Neutral affect induction condition

In the neutral affect induction condition, there was a significant overall main effect of group, with the schizotypy group reporting higher negative/lower positive affect both pre- and post-condition. In addition, effects for time and the group by time interaction approached significance at a trend level. As illustrated in Fig. 2, while the control group’s ratings appeared relatively consistent from pre- to post-neutral stimuli presentation, the schizotypy group’s scores became less negative/more positive following stimuli presentation. Thus, the schizotypy group also appeared to experience some improvement in affect following neutral stimuli presentation, moving in the direction of the control group’s ratings, while the control group’s affect remained stable.

3.2.3. Unpleasant affect induction condition

In the unpleasant affect induction condition, there was a significant main effect of group, with the schizotypy group reporting higher negative/lower positive affect both pre- and post-condition, and a significant main effect of time, with each group reporting an increase in negative/decrease in positive affect in reaction to presentation of the unpleasant stimuli. There was also a significant group by time interaction. As illustrated by Fig. 3, the schizotypy group reported higher negative/lower positive affect than the control group, and both groups reported an increase in negative/decrease in positive affect in reaction to the presentation of the unpleasant stimuli. Following stimuli presentation, though, the ratings of the control group begin to approach those of the schizotypy group, indicating that both groups’ reactions to the unpleasant stimuli were somewhat similar, but the control group experienced a greater change from baseline to reach such point.

3.3. State lexical expressivity

There were no group differences in total speech production (i.e., word count) across any of the affect induction conditions (all Fs<1.56, Ps>0.29). There was, however, a significant omnibus effect of group (Wilks’ Λ = 0.80, F(6, 108) = 4.41, P<0.001) for affective word choice across the three conditions. Follow-up tests revealed that in the pleasant affect induction condition, the schizotypy group used a significantly smaller percentage of positive affect words (M = 5.18; S.D. = 1.64) compared to controls (M = 6.28, S.D. = 1.90; F(1, 113) = 7.50, P<0.01) and a larger percentage of negative affect words (M = 0.98, S.D. = 0.55) compared to controls (M = 0.67, S.D. = 0.45; F(1, 113) = 6.14, P<0.05). In the neutral affect

Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Rating means (S.D.)</th>
<th>F values</th>
<th>d.f.</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Pre-condition</td>
<td>Post-condition</td>
<td>Group</td>
</tr>
<tr>
<td>Pleasant condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizotypy</td>
<td>4.50 (0.95)</td>
<td>3.70 (1.26)</td>
<td>27.79**</td>
</tr>
<tr>
<td>Control</td>
<td>3.28 (1.27)</td>
<td>2.67 (1.13)</td>
<td></td>
</tr>
<tr>
<td>Neutral condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizotypy</td>
<td>4.84 (1.16)</td>
<td>4.44 (0.97)</td>
<td>15.65**</td>
</tr>
<tr>
<td>Control</td>
<td>3.76 (1.47)</td>
<td>3.74 (1.19)</td>
<td></td>
</tr>
<tr>
<td>Unpleasant condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizotypy</td>
<td>4.51 (1.08)</td>
<td>6.26 (1.49)</td>
<td>15.12**</td>
</tr>
<tr>
<td>Control</td>
<td>3.19 (1.39)</td>
<td>5.74 (1.34)</td>
<td></td>
</tr>
</tbody>
</table>

** P<0.001.
† P<0.10.
* P<0.01.
induction condition, the schizotypy group used a significantly larger percentage of negative affect words (M = 1.08, S.D. = 0.61) than controls (M = 0.76, S.D. = 0.68; F(1, 113) = 5.22, P < 0.05); but group differences for expression of positive affect were non-significant (schizotypy: M = 2.46, S.D. = 1.11; controls: M = 2.46; S.D. = 1.19; F(1, 113) = 0.006, P = 0.94). In the unpleasant affect induction condition, there were no significant group differences in expression of positive affect (schizotypy: M = 1.97, S.D. = 0.86; controls: M = 1.75; S.D. = 0.98; F(1, 113) = 1.76, P = 0.19) or negative affect (schizotypy: M = 4.35, S.D. = 1.40; controls: M = 4.53; S.D. = 2.86; F(1, 113) = 0.15, P = 0.70). Fig. 4 illustrates word use by schizotypy and control groups across the various conditions. In order to allow comparison across conditions, results are displayed in z-score format.

3.4. Schizotypy trait correlations

Within the schizotypy group, across schizotypal trait dimensions, Negative SPQ scores were significantly inversely correlated with Positive Affect on the PANAS (r = −0.35, P < 0.01). No other correlations between SPQ and self-reported trait affect scores were significant (r’s < 0.13, P’s > 0.21).

With regard to self-reported state affect within the schizotypy group, there were no significant correlations between schizotypy trait dimensions and pre- or post-condition ratings across any of the affect induction conditions (r’s < 0.12, P’s > 0.29). In addition, pre-to post-condition changes in state ratings were examined dimensionally within the schizotypy group by correlating SPQ trait dimensions with standardized residuals calculated by regressing pre-condition ratings from post-condition ratings for each condition. Again, there were no significant correlations (r’s < 0.13, P’s > 0.22). These results suggest that the affective disruptions apparent across conditions appear to characterize the heterogeneous group of schizotypy participants, rather than just being driven by a particular symptom presentation.

Within the schizotypy group, Disorganized SPQ scores were significantly correlated with percentage of positive words used in the unpleasant affect induction condition (r = 0.22, P < 0.05); but no other correlations between schizotypy dimensions and lexical patterns were significant (r’s < 0.15, P’s > 0.16).

4. Discussion

Schizotypal participants self-reported significantly higher amounts of negative trait affect and lower amounts of positive trait affect than controls. They also reported experiencing significantly higher negative/ lower positive state affect compared to controls across all affect induction conditions, although the patterns of pre- to post-condition ratings differed across conditions—the groups’ reported affect ratings became more alike following exposure to unpleasant stimuli, but the schizotypy group’s affect ratings remained significantly more negative/ less positive than the controls’ following exposure to pleasant stimuli. Lexical expressivity showed a similar pattern across the conditions—there were no group differences in positive or negative word use in the unpleasant condition, but in the pleasant condition the schizotypy group used a higher percentage of negative and a lower percentage of positive words.

It is notable that these results are consistent with the majority of recent studies finding that, unlike schizophrenia (e.g., Cohen and Minor, 2010), self-reported state and trait affect are consistent in schizotypy. Further research in this area, comparing mechanisms underlying affective disruption in schizotypy and schizophrenia may illuminate issues related to temporal developmental patterns of schizophrenia-spectrum disorder. For example, it may be that mechanisms influencing the discrepancy between state and trait affect in schizophrenia (see Cohen et al., 2011b, for a review of current research and theory regarding this discrepancy) are not yet prominent in the prodromal stage.

Of particular interest was the difference in group patterns of pre- to post-condition changes in state affect ratings across conditions. Both control and schizotypy participants’ ratings changed in response to presentation of the unpleasant stimuli; but the magnitude of change of the control group’s ratings was relatively larger than the schizotypy group’s, such that the control group’s ratings “caught up” with the negativity of schizotypy group’s ratings, which were relatively more negative than the controls’ prior to stimuli presentation. By contrast, although both groups’ ratings became more positive
in response to the pleasant affect induction condition, the schizotypy group's affect ratings remained consistently less positive/more negative than the controls' following the pleasant stimuli presentation. Taken together, these results suggest a differential ceiling effect for the schizotypy group's subjectively experienced reactivity in pleasant versus unpleasant situations. Both groups showed similar capacity to experience negative affect in response to unpleasant stimuli, but the schizotypy group showed a deficit in capacity to experience positive affect in response to pleasant stimuli. Analysis of lexical expressivity revealed patterns of affective disruption similar to self-reported affective experience across conditions. Schizotypal participants used a lower percentage of positive affect words and higher percentage of negative affect words than controls in the pleasant, but not unpleasant, affect induction condition. Thus, it appears that this affective dysfunction in schizotypy is most readily apparent in pleasant conditions, both in terms of self-reported subjective experience and expressive verbal behavior. Furthermore, this overall pattern of state affective disruption appeared to characterize the schizotypy participants as a heterogeneous group, and was not driven by a specific schizotypal trait dimension. Across state affect outcome variables, the only significant relationship was a small correlation between disorganization symptoms and expression of positive affect in the unpleasant affect induction condition, consistent with Kerns' (2006) finding that disorganized schizotypy traits are associated with increased emotionality (increased intensity of emotions, attention to emotions, and influence of emotions) and emotional confusion (decreased emotional clarity and increased ambivalence).

Limitations of this study include the fact that measurement of self-reported state affects in a bi-polar manner (i.e., using a Likert scale ranging from positive to negative affect on a single continuum) may have concealed nuances of experience that may have been revealed had state affect been measured in a uni-polar manner (i.e., using separate positive and negative scales), as was the case for trait affect and lexical expression. In addition, it is possible that schizotypal college students' state experience of affective dysfunction during specific laboratory based affect induction conditions may not be generalizable to non-college students' subjective state experiences.

Overall, though, these state-specific findings add to a handful of existing studies finding that affective dysfunction may be more apparent for objectively pleasant situations in individuals with or at-risk for development of schizophrenia (Hempel et al., 2005; Neumann et al., 2007; Kerns et al., 2008). They also cast light on the interaction between pervasively negative baseline affect and in-the-moment reactivity to emotionally valenced experiences. Future research on the relationship between baseline affect, subjective affective experience, and various modes of emotional expressivity in situations in which positive affect may otherwise be expected to predominate may cast further light on the path of emotional dysfunction for individuals who go on to develop schizophrenia-spectrum disorders.

References


